CLE

320

METEOROLOGICAL
21 MAR 1970
LIBRARY

RESTRICTED CIRCULATION

This paper is not an official document; it is for information only and reference cannot be made to it in any printed publication without the permission of the author.

AGRICULTURAL MEMORANDUM NO. 320

VARIATION OF FROST FREQUENCY WITH HEIGHT IN CUMBERLAND AND WESTMORLAND

01053

B INGHAM

The Agricultural Land Service recently asked about the frequency of frost in these counties in order to help decide the eligibility of land for hill subsidies.

Long term data for most sites do not exist and to answer the question resort had to be made to connecting short term averages from data available in the MWR. An added complication in the case of ground frost was the change in definition in 1960. As well as being related to the state of the atmosphere the numbers of air and ground frosts are also dependent on the type of soil and ground cover at individual sites and the position of the sites with respect to their surroundings. Bearing in mind the inhomogeneity of the observations it is somewhat surprising to find some linear relationships when average numbers of frost per month are plotted against the heights of the stations. These relationships may be quite fortuitous but they seemed to form a useful basis for an answer to this question and may be a starting point for further studies.

Diagrams of the relationships are shown for air and ground frosts for spring and autumn. It is interesting to note that there is a major difference in the slope of the lines between spring and autumn. After allowances for differences in numbers due to differences in soil type, aspect etc. it appears that in spring there will be one extra ground frost per month for every 170 feet gained in height whereas in autumn the height increment is about 330 feet.

In the case of air frost the relationships do not fall into such distinct groups but follow a pattern of decreasing lapse from March to May and an increasing lapse from October to November. The relationships may be states as follows:

There will be an increase of one air frost for approximately every

170	feet	height	gained	in March
220	feet	"	"	" April
400	feet	"	"	" May
1,000	feet	"	"	" October
200	feet	"	"	" November

There will be an increase of one ground frost for approximately every

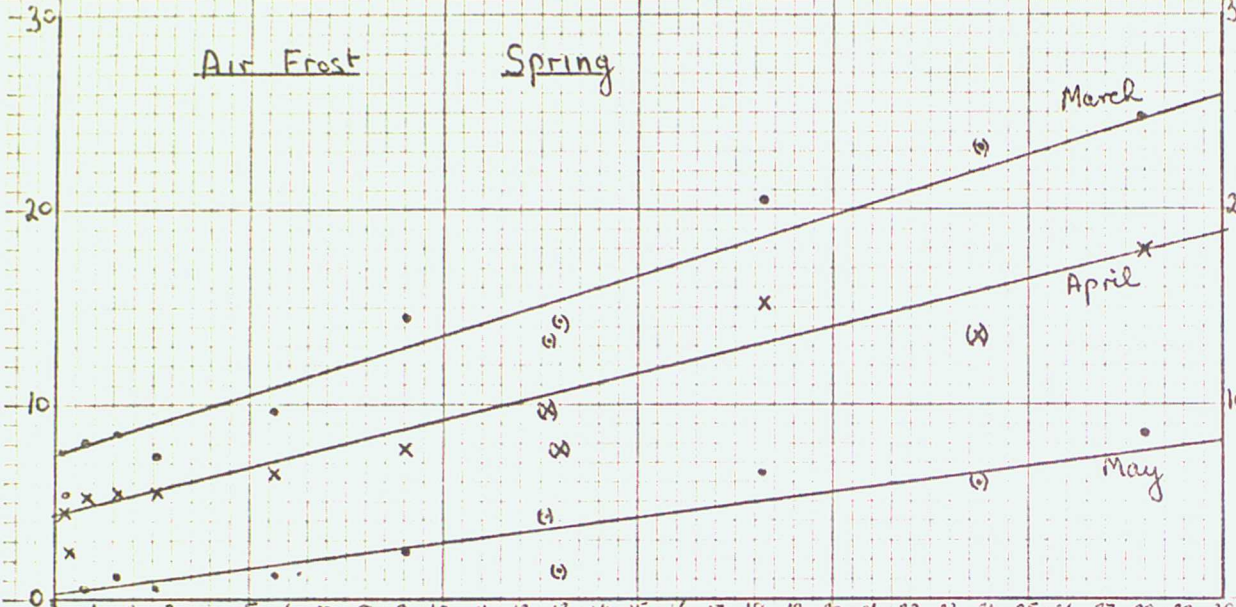
170	feet	height	gained	in spring
330	feet	"	"	" autumn

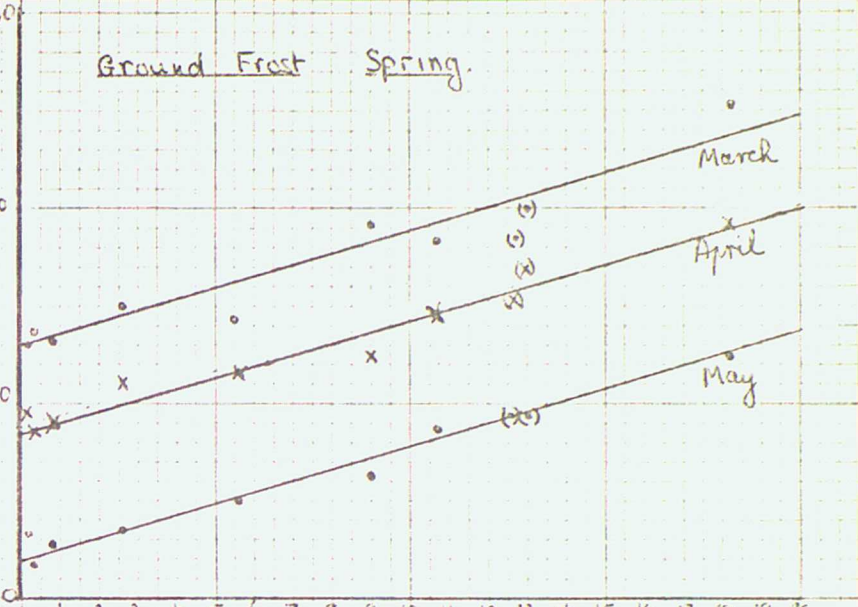
Any comments or suggestions on this paper should be sent to the author.

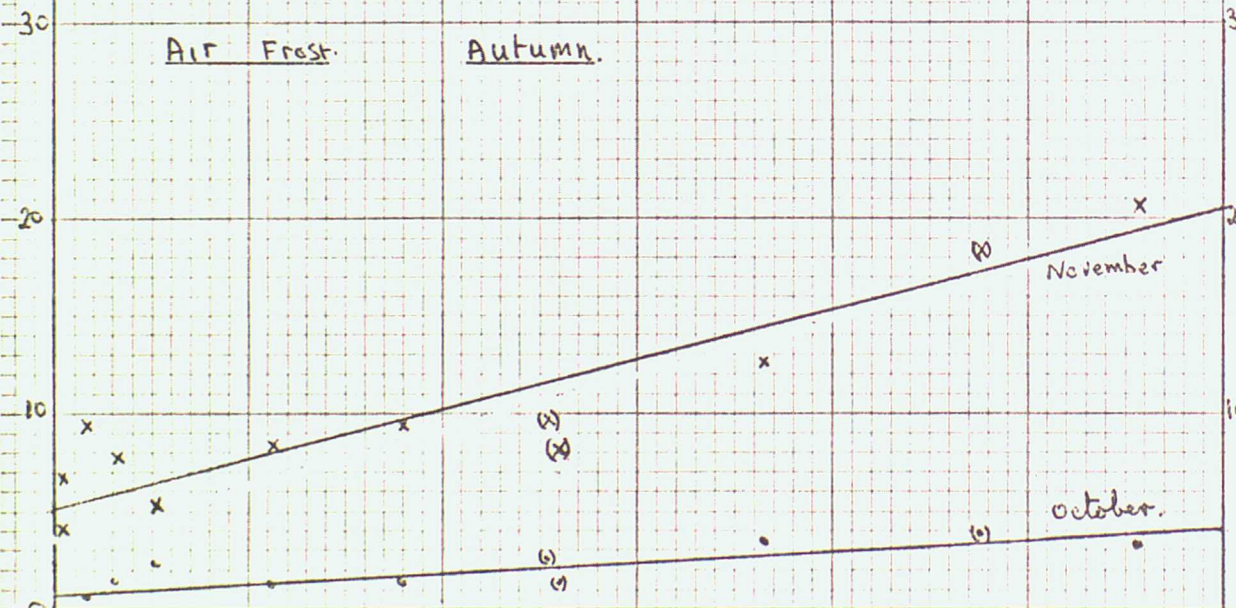
Meteorological Office
NAAS
Government Buildings
Lawnswood
Leeds LS16 5PY

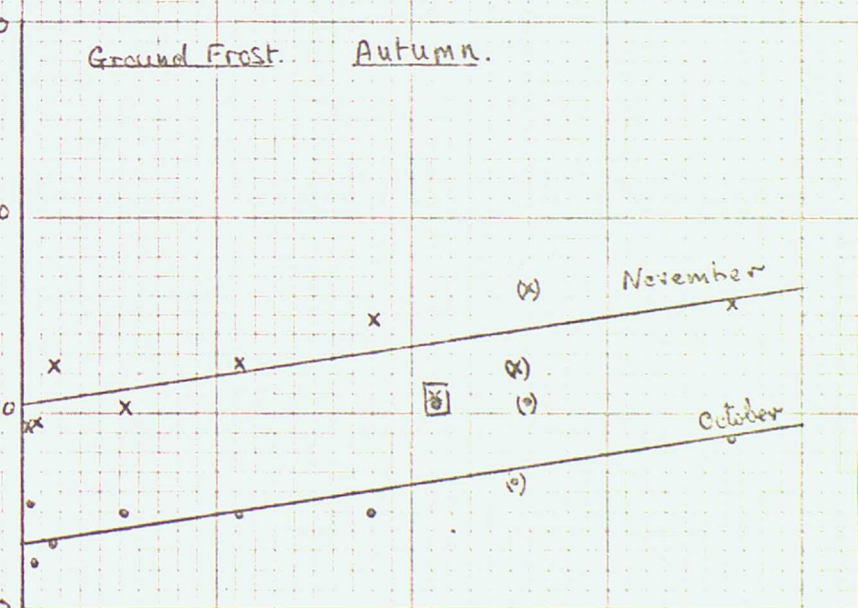
April 1970

FH1


Air Frost
Spring
March
April
May
Number of Frosts per month
0
10
20
30
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30


Ground Frost
Spring.
March
April
May
0
10
20
30
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20


Air Frost.
Autumn.
November
October.
Number of Frosts per month.
0
10
20
30


Ground Frost.
Autumn.
November
October
0
10
20
30

The stations used and their details are shown in the accompanying table.

			March		April		May		October		November	
Silloth 1951-60	25ft	AF	7.8		4.6		0.5		2.5		4.3	
		GF		13.0		9.6		3.2		5.5		9.2
Sellafield 1952-69	43ft	AF	5.2		2.5		-		-		3.9	
		GF		13.6		8.6		1.9		2.1		9.5
Carlisle 1961-69	86ft	AF	8.1		5.2		0.5		0.8		9.5	
		GF		13.2		9.0		2.9		3.2		12.5
Ambleside 1956-69	151ft	AF	8.6		5.4		1.1		1.6		7.8	
Keswick 1951-58	254ft	AF	7.3		5.5		0.7		2.5		5.1	
		GF		15.0		11.0		3.5		5.0		10.3
Newton Rigg 1956-69	560ft	AF	9.7		6.3		1.1		1.4		8.3	
		GF		14.4		11.6		5.0		4.9		12.6
Spadeadam 1960-69	900ft	AF	14.7		7.8		2.3		1.3		9.4	
		GF		19.1		12.3		6.2		5.0		14.9
Alston 1953-57	1070ft MAN	GF		18.2		14.6		8.8		10.3		10.5
1953-56	ON											
Leadhills 1914-27, 1953-64	1270ft	AF	13.2		9.9		4.3		2.7		9.9	
		GF		18.5		15.3		9.4		6.5		12.1
Malham Tarn 1949-69	1297ft	AF	14.2		7.7		1.5		1.4		8.1	
		GF		20.0		16.9		9.4		10.8		16.4
Moor House 1956-69	1825ft	AF	20.4		15.2		6.6		3.6		12.7	
		GF		25.1		19.2		12.4		8.7		15.7
Lowther Hill 1960-68	2377ft	AF	23.2		13.6		6.0		3.9		18.3	
Great Dunn Fell 1963-69	2780ft	AF	24.9		18.0		8.6		3.2		20.8	